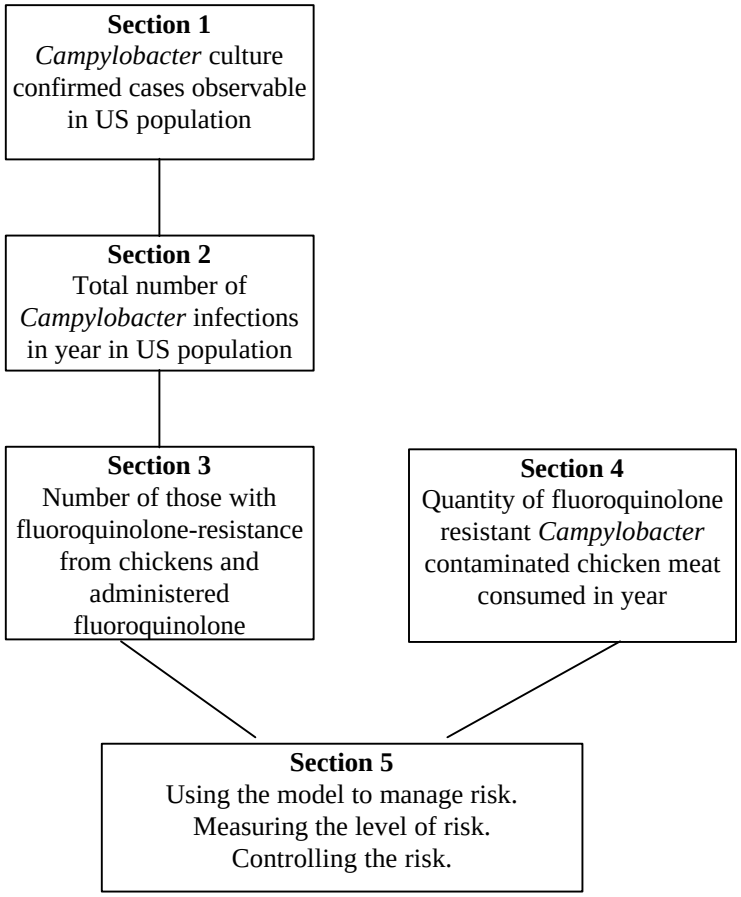
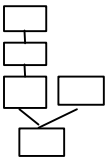
Overview of Model Structure



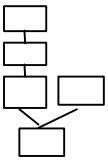
The following table is a brief summary of the mathematics used in each section of the model. Each section output is emphasized in bold type. Appendix B illustrates the Microsoft Excel / Palisade @RISK spreadsheet in which Sections 1 to 4 of this model was performed. The numeric values displayed in the first block of spreadsheet cells are the means (expected values) of the uncertainty distributions. The second block of spreadsheet cells provide a list of the formula to enable reproduction of the model. Further explanations of the modelling of each section are provided in the next section.

The model brings together two branches to match an estimate of the human health impact due to fluoroquinolone resistant *Campylobacter* from domestically reared broilers (Sections 1 to 3) with an estimate of the quantity of fluoroquinolone resistant *Campylobacter* contaminated broiler meat consumed domestically (Section 4). In Section 5, the human health risk is assessed for different population bases and these two quantities are compared in a discussion to determine an effective monitoring system that will warn of the approach of an unacceptable human health impact threshold.



51
52

Symbol	Description	Formula
Section 1	**Expected nominal number of observable confirmed cases**	
n_{US}	US population	Data
n_{FN}	FoodNet catchment population	Data
o_i	FoodNet observed invasive cases of *Campylobacter*	Data
o_e	FoodNet observed enteric cases of *Campylobacter*	Data
λ_i	Expected observed FoodNet invasive cases of *Campylobacter*	=Gamma(o_i,1)
λ_e	Expected observed FoodNet enteric cases of *Campylobacter*	=Gamma(o_e,1)
N_i (= $N1_i$)	Nominal observed mean invasive infections in population	$=\lambda_i * n_{US} / n_{FN}$
N_e	Nominal observed mean enteric infections in population	$=\lambda_e * n_{US} / n_{FN}$
p_b	Proportion of enteric infections with bloody diarrhea	Beta distribution based on data
$N1_{eb}$	Nominal mean number of confirmed enteric infections in population with bloody diarrhea	$=N_e * p_b$
$N1_{en}$	Nominal mean number of confirmed enteric infections in population with non-bloody diarrhea	$=N_e*(1- p_b)$
Section 2	**Estimate of expected total number of illnesses in US population**	
p_{bm}	Proportion of *Campylobacter* bloody diarrhea enteric infections seeking medical care	Beta distribution based on data
p_{nm}	Proportion of *Campylobacter* non-bloody diarrhea enteric infections seeking medical care	Beta distribution based on data
p_{bc}	Proportion of enteric bloody diarrhea infections seeking care who are requested to supply stool sample and comply	Composite distribution based on data
p_{nc}	Proportion of enteric non-bloody diarrhea infections seeking care who are requested to supply stool sample and comply	Beta distribution based on data
p_t	Proportion of submitted stool specimens that are tested by the laboratory	Beta distribution based on data
p_+	Proportion of infected stool specimens that test positive	Beta distribution based on data
$N2_i$	Estimate of expected number of people in US population ill with invasive disease *Campylobacter* in year	$=N1_i$
$N2_{eb}$	Estimate of expected number of people in US population ill with enteric *Campylobacter* infection and bloody diarrhea in year	$=N1_{eb}/(p_{bm}*p_{bc}*p_t*p_+)$
$N2_{en}$	Estimate of expected number of people in US population ill with enteric *Campylobacter* infection and non-bloody diarrhea in year	$=N1_{en}/(p_{nm}*p_{nc}*p_t*p_+)$
$N2_T$	Estimate of expected total number of people in US population with *Campylobacter* infection	$=N2_i+N2_{eb}+N2_{en}$
Section 3	**Estimate of expected number of people with fluoroquinolone-resistant *Campylobacter* infections from domestically consumed chicken seeking care and receiving fluoroquinolone treatment in time**	
$p_{ca\text{-}min}$	Minimum proportion of *Campylobacter* infections relating to domestically consumed chicken	Based on two referenced estimates
$p_{ca\text{-}max}$	Maximum proportion of *Campylobacter* infections relating to domestically consumed chicken	Based on referenced estimate
p_{ca}	Proportion of *Campylobacter* infections relating to	Uniform($p_{c\text{-}min}$, $p_{c\text{-}max}$)



	domestically consumed chicken	
p_{nm}, p_{bm}	Proportion of *Campylobacter* enteric (non-bloody and bloody) illnesses seeking medical care	From Section 1
p_{an}	Proportion of those with non-bloody enteric infection seeking medical care who are treated with a medication	Composite estimate based on data
p_{ab}	Proportion of those with bloody enteric infection seeking medical care who are treated with a medication	Composite estimate based on data
p_{FQ}	Proportion of those who are treated who are prescribed fluoroquinolone	Weighted estimate based on data
p_{rh}	Proportion of *Campylobacter* infections from chicken that are resistant to fluoroquinolone	Weighted estimate based on data
$N3_i$	Estimate of expected number of people with invasive *Campylobacter* infection from chicken for whom fluoroquinolone-resistance resulted in a longer illness	$= N2_i * p_{ca} * P_{FQ} * p_{rh}$
$N3_{eb}$	Estimate of expected number of people with enteric *Campylobacter* infection from chicken with bloody diarrhea for whom fluoroquinolone-resistance resulted in a longer illness	$= N2_{eb} * p_{ca} * p_{bm} * P_{ab} * P_{FQ} * p_{rh}$
$N3_{en}$	Estimate of expected number of people with enteric *Campylobacter* infection from chicken with non-bloody diarrhea for whom fluoroquinolone-resistance resulted in a longer illness	$= N2_{en} * p_{ca} * p_{nm} * P_{an} * P_{FQ} * p_{rh}$
$N3_T$	Estimate of expected total number of people with *Campylobacter* infection from chicken for whom fluoroquinolone-resistance resulted in a longer illness	$= N3_i + N3_{eb} + N3_{en}$
Section 4	**Estimating year's consumption of domestically reared chickens contaminated with fluoroquinolone resistant *Campylobacter* in the US**	
p_c	Prevalence of *Campylobacter* in chicken carcasses at end of slaughter processing	Beta distribution based on data
p_{rc}	Prevalence of FQ resistant *Campylobacter* among *Campylobacter* isolates	Beta distribution based on data
p_p	Estimated prevalence of fluoroquinolone-resistant *Campylobacter* in broiler carcasses	$= p_c * p_{rc}$
c	Consumption of boneless domestically reared chickens in US per head (lbs)	Data
V_c	Volume of boneless domestically reared chicken consumed by US citizens (lbs)	$= c * n_{US}$
V_i	Total consumption of boneless domestically reared chicken contaminated with fluoroquinolone resistant *Campylobacter* in US (lbs)	$= n_c * p_C$